Chapter 3
Resources of the LCR

3.1 Introduction

This chapter describes the past and present environmental conditions of the LCR MSCP planning area. Past and present ecological conditions in the LCR MSCP planning area are described in Section 3.2, "Historical Conditions." Section 3.3, "Baseline Conditions," describes the existing ecological conditions from which potential impacts of implementing the covered activities and LCR MSCP on covered species are assessed. Section 3.4, "Land Cover Types Used for Species Habitat Models," describes the land cover types that are present in the LCR MSCP planning area and are used to determine the existing extent of covered species habitats. The status of covered species and designated critical habitat is described in Section 3.5, "Status of Covered and Evaluation Species Habitats in the LCR MSCP Planning Area" and Appendix I, "Status of LCR MSCP Covered Species."

3.2 Historical Conditions

This section summarizes historical conditions of the LCR ecosystem. Major sources used to prepare this summary include:

- *Biological Assessment, Description and Assessment of Operations, Maintenance, and Sensitive Species of the Lower Colorado River* (Bureau of Reclamation 1996);
- *Biological and Conference Opinion on the Lower Colorado River Operations and Maintenance-Lake Mead to the Southerly International Boundary* (U.S. Fish and Wildlife Service 1997);
- *Resource Use by Native and Non-Native Fishes of the Lower Colorado River: Literature Review, Summary and Assessment of Relative Roles of Biotic and Abiotic Factors in Management of an Imperiled Indigenous Ichthyofauna* (Pacey and Marsh 1998); and
- *Biological Assessment, Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary* (Bureau of Reclamation 2000a).

The LCR has undergone dramatic changes since the late 1800s (Table 3-1). Prior to water development, the Colorado River flowed unimpeded and was a highly dynamic system. Seasonal water fluctuations and associated high sediment loads were major elements contributing to the physical and biological characteristics of the river. Water flows and sediment loads ranged widely, from flows exceeding 100,000 cubic feet per second (cfs) in May–July (when water runoff was greatest) to flows of 5,000 cfs or less during late fall and winter (Grinnell 1914; Carothers and Minckley 1981). Sediment loads were highest during August and September; loads in May and June were also high (Turner and Karpiscak 1980). Sediment loads at Yuma averaged more than 10^8 metric tons per year (U.S. Geological Survey 1973).

This wide flow fluctuation allowed geologic processes such as aggradation (i.e., deposition of sediment that raises the elevation of the floodplain) and degradation or scouring (i.e., erosion that lowers the elevation of the floodplain) to occur and forced biological communities to adapt to the constantly changing environment. Swift, sediment-filled flows scoured the canyons in the LCR, which hindered the establishment of most riparian plant communities. Conversely, aggradation occurred when the water and sediment were released from the narrow canyons into the broad valleys where soil deposition took place allowing backwaters, marshes, and riparian areas to establish.

The river bottom changed constantly as bedload was transported (Minckley 1979). Native plant communities became established within the broad valley river reaches extending away from the river for up to several miles where the water table was relatively shallow. In addition, meandering of the river caused by occasional large flows created or reconnected oxbows and backwaters. Among the larger historical backwaters and/or oxbows were Beaver Lake, Lake Su-ta-nah, Duck Lake, Spears Lake, Powell Slough (now part of Topock Marsh), and Lake Tapio. All were located between what are now Bullhead City and Topock (Ohmart et al. 1975).

Because of the seasonality of the flooding, several communities of plants and animals developed in response to high flows taking place from May to July and low flows occurring during the winter months. Riparian communities along the river were constantly undergoing change in response to variable rates of aggradation and degradation in the river channel and near stream areas. Floodplain communities developed in areas that were seasonally, or only intermittently, inundated. Marsh communities developed in areas of extended inundation.

Conditions in the LCR ecosystem have changed because of anthropogenic influences (Fradkin 1981 cited in Pacey and Marsh 1998). Table 3-1 provides a timeline for major events that have affected conditions in the LCR MSCP planning area, including water development activities, changes in vegetation, and introductions of non-native species.

3.2.1 Facilities Construction

Construction of facilities, including water diversion structures, dams, and flood control facilities, resulted in the most radical physical change that the river system has undergone. These facilities altered the natural hydrologic regime, which in turn altered biological communities within the system.

Year	Event
1700–1800	Lower Colorado River (LCR) explored by Spanish priests and military, culminating with the establishment of a mission at Yuma in 1774 and its subsequent destruction by Yuma Indians in 1781 (Ohmart et al. 1988).
1848	LCR area north of the Gila River acquired by United States.
1840–1870	LCR explored by U.S. military. Most of early expeditions explored possible transportation routes. Notes on the geology, flora, and fauna of LCR were made.
1850	Fort Yuma established by U.S. Army.
1852	First steamboat, the *Uncle Sam,* captained by James Turnbull, traveled up Colorado River to resupply Fort Yuma. This activity marked beginning of the steamboat trade, which would eventually have profound effects on mature riparian areas along the river (Lingenfelter 1978).
1854	Gadsden Purchase consummated, extending U.S. territory south of the Gila River to the present border with Mexico.
1857	LCR, from Yuma, Arizona, north to present site of Hoover Dam, explored by J.C. Ives; region reported to be valueless.
1862	Colorado River gold rush began. The 1861 silver strike at El Dorado Canyon and the 1861 gold strike at Laguna de la Paz created Colorado River Gold Rush of 1862 (Lingenfelter 1978). Gold rush fueled steamboat trade along LCR. Initially, downed, dried cottonwood, willow, and mesquite were used as fuel for the steamboats (Ives 1861). Increased river traffic soon used all available wood debris, and crews began cutting down large quantities of cottonwoods, willows, and mesquites. By 1890, most large cottonwood-willow stands and mesquite bosques had been cut over (Ohmart et al. 1988, Grinnell 1914). Natural regeneration continued to establish new stands with each annual flood event.
1869	Colorado River from Green River in Utah to Virgin River confluence explored by John Wesley Powell.
1877	Rail line over the Colorado River completed by Yuma Southern Pacific Railroad. First diversion of water from LCR constructed by European settlers for irrigating the Palo Verde Valley near Blythe, California.
1883	Second rail line crossed the river. Together with crossing at Yuma, crossing at Needles by Atlantic and Pacific Railroad in 1883 sounded the death knell of steamboat trade along the LCR (LaRue 1916). Steamboat commerce further reduced by declines in mining, and by 1887, steamboats no longer traveled above Eldorado Canyon (Lingenfelter 1978).
1885	First documented improvements on LCR were made. Lieutenant S.W. Roessler hired a barge and crew to make improvements at Six Mile Rapids and Mojave Crossing for navigation, which was first recorded instance of alteration of river (Smith 1972).
	Carp known to be established in LCR ecosystem, altering the native fish fauna for the first time (Minckley 1973).
1892	Channel catfish stocked into the Colorado River by Arizona Game and Fish (LaRivers 1962).
1895	Construction began on Alamo Canal at Yuma to irrigate the Imperial Valley.
Late 1800s to early 1900s	Saltcedar, which was introduced into United States as an ornamental tree, escaped cultivation by the late 1800s. Expansion of saltcedar range was rapid by the early 1900s, especially between 1935 and 1955 along the Colorado River (DeLoach 1989).
1901	Alamo (Imperial) Canal completed; water diverted near Yuma and conveyed through Mexico to irrigate the Imperial Valley in California; canal supplied 700 miles of lateral canals, enabling irrigation of 75,000 acres.
1902	Reclamation Act passed establishing U.S. Reclamation Service. U.S. government began planning large-scale irrigation projects (LaRue 1916).

Year	Event
1905	Temporary diversion structure at Alamo Canal heading breached by flood on Gila River, and Colorado River flowed into Salton Sink.
1907	Dike repaired and river redirected back to the correct channel by Southern Pacific Railroad. Salton Sea was accidentally created from Colorado River floodwaters; 330,000 acres were inundated; flooding increased political pressure to dam the Colorado River.
1909	Laguna Diversion Dam completed; water diverted through the Yuma Main Canal to irrigate 53,000 acres in the Yuma Valley, Arizona, and 14,700 acres in the Reservation Division in California, and through the North Gila Canal to irrigate 3,500 acres in the Gila Valley, Arizona.
1910	Three-month expedition from Needles to Yuma led by Joseph Grinnell to collect data on mammals, birds, and associated habitats. Expedition provided one of first detailed accounts of flora and fauna of LCR. Grinnell observed carp and catfish, documented effects of Laguna Dam on the ecosystem, and documented loss of riparian vegetation to agriculture (Grinnell 1914).
1913	Estimated acreage of irrigated land between Virgin River and Southerly International Boundary was 367,000 acres, most of this land was in Imperial Valley (LaRue 1916). Along the mainstem Colorado River between Cottonwood Basin and the U.S./Mexico border, the conversion of 53,000 acres to irrigated agriculture land resulted in substantial loss of riparian vegetation.
1920	Saltcedar appeared along mainstem of the Colorado River (Ohmart et al. 1988). This species is well suited to changed riverine ecosystem and displaced native riparian species throughout LCR. Important wildlife habitats, including the cottonwood-willow gallery forests, all but disappeared from Colorado River and were replaced by less desirable saltcedar (Anderson and Ohmart 1984a).
1922	Colorado River Compact signed, whereby water was allocated between the upper (Colorado, Wyoming, New Mexico, Utah) and lower (California, Nevada, Arizona) basins.
1927	Irrigated acreage along the mainstem of LCR increased from 53,000 acres in 1913 to 95,000 acres in 1927 (Wilbur and Ely 1948). Increase resulted in further decreases in extent of riparian vegetation.
1935	Boulder Dam (now Hoover Dam) completed; Lake Mead covered 300 square miles and stored 31 million acre-feet (maf) of water, enough to irrigate 650,000 acres in California and Arizona and 400,000 acres in Mexico. Hydrography of river changed; devastating floods were eliminated. Hydropower of 4 billion kilowatt-hours produced annually.
	U.S. Fish and Wildlife Service (USFWS) stocked largemouth bass, bluegill sunfish, green sunfish, and black crappie in Lake Mead and rainbow trout into river below Lake Mead (Jonez and Sumner 1954).
1938	Parker Dam completed; Lake Havasu behind the dam covers 39 square miles and stores 600,000 acre-feet of water. Metropolitan Water District of Southern California diversions into the Colorado River Aqueduct initiated.
	Imperial Dam completed; additional water diverted via the Gila Gravity Main Canal and the All American Canal for irrigating southeast California and southwest Arizona.
	Pilot Knob Wasteway off All American Canal completed, allowing water to be diverted from behind Imperial Dam on the California side to be returned to the river.
1938–1939	Although largemouth bass and bluegill already present in system, State of California planted additional stocks to increase spread of species (Dill 1944).
1939	Gila Gravity Main Canal completed, replacing the North Gila Canal (from behind Laguna Dam) and delivering irrigation water from behind Imperial Dam to irrigate 105,000 acres in Arizona’s Gila Valley.
1940	All-American Canal completed, replacing Alamo Canal and delivering irrigation water from behind Imperial Dam to Imperial Valley in California; 461,642 acres currently irrigated.
1941	Havasu National Wildlife Refuge (NWR) established near Needles, California. Imperial NWR established near Martinez Lake, Arizona.
	Siphon Drop completed, delivering irrigation water from All-American Canal to Yuma Valley in Arizona; it replaced Yuma Main Canal (sealed in 1948), originating behind Laguna Dam.

Year	Event
1944	Headgate Rock Dam completed; irrigation water diverted to Colorado River Indian Tribes Reservation near Parker, Arizona; water diverted to enable irrigation of 107,588 acres.
1948	Coachella Canal completed; water from All-American Canal conveyed to Coachella Valley in California; 58,579 acres currently irrigated.
	Red shiners introduced to Colorado River as baitfish.
1950	Morelos Diversion Dam completed; irrigation water delivered by Mexico to Mexicali Valley.
	Davis Dam closed and first water storage for Lake Mohave begun in January 1950. Powerplant still under construction.
1952	Yuma Division stabilized from Laguna Dam to Southerly International Boundary; 17.6 miles of levees constructed; 17.4 miles of channel dredged; 264,000 cubic yards of riprap placed; 41 miles of access roads constructed.
1953	Davis Dam and power plant completed, providing regulation of water to be delivered to Mexico and regulating flows from Hoover Dam; Lake Mohave behind dam capable of storing 1.8 maf of water.
	Mohave Division from Davis Dam to Topock, Arizona, channelized and stabilized; 31 miles of channel dredged, 288,082 cubic yards of riprap placed, and 47 miles of levees built.
1954	Laguna Dam no longer used for diversion (Imperial Dam used instead).
	Threadfin shad introduced into Lake Mead (274 fish). Second release in 1955 of 11,000 fish resulted in successful establishment in Lake Mead (Allan and Roden 1978).
1955	Threadfin shad introduced into Lake Mohave (6,000 fish) (Allan and Roden 1978).
1956	Topock Desilting Basin completed, providing control of river sediment near Needles, California; 4,400,000 cubic yards of material excavated.
1957	Palo Verde Diversion Dam completed; irrigation water continues to be diverted to the Palo Verde Valley near Blythe, California; 121,000 acres under irrigation.
1959	Striped bass introduced by State of California into Colorado River near Blythe (introduced into Lake Havasu in 1960). This species became top fish predator in the Colorado River system.
1962	Flathead catfish introduced into river by State of Arizona.
1963–1967	*Tilapia* introduced into Colorado River by California and Arizona.
1964	Cibola NWR was established near Blythe, California.
1965	Laguna Desilting Basin completed, providing control of river sediment north of Yuma, Arizona; 3,120,000 cubic yards of material excavated.
	Irrigated acreage estimated at 293,000 acres along mainstem of LCR (Lower Colorado Region State-Federal Interagency Group for the Pacific Southwest Interagency Committee 1971).
1966	Senator Wash Dam and Reservoir completed north of Yuma; reservoir covered 470 acres and held 13,836 acre-feet of water.
	Topock Marsh inlet and outlet structures completed, providing 4,000 acres of marsh at Havasu NWR.
1967	Palo Verde Oxbow inlet and outlet structures completed near Blythe, California, to provide wildlife habitat.
1968	River channel stabilized from Palo Verde Diversion Dam to Taylor Ferry, 19.5 miles. Banklines armored in Parker Division, Section I; 11 miles stabilized.
1969	Training structures south of Laughlin, Nevada, completed, reducing bankline erosion.
	Striped bass introduced into Lake Mead in 1969–1972, creating the first documented establishment of a persistent reproducing population of striped bass in the LCR in the pelagic zone of a reservoir not connected to a suitable riverine reach.
1970	Mittry Lake inlet structure completed, south of Imperial Dam, to provide wildlife habitat.
	Cibola Division stabilized from Taylor Ferry to Adobe Ruin; 16 miles dredged.

Year	Event
1974	Cibola Lake inlet and outlet structures completed at Cibola NWR to improve wildlife habitat.
1980	Bonytail listed as endangered under the Federal Endangered Species Act (ESA).
1983	Reservoirs on entire lower river spilled for first time as a result of extremely high precipitation from El Niño weather event.
1985	Inlet structure to the Central Arizona Project aqueduct behind Parker Dam completed; water diverted to supply Phoenix and Tucson, Arizona; 1.5 maf currently diverted.
1986	Hoover Dam power plant upgrade from 1,448-megawatt to 1,951-megawatt output started. (Upgrade was completed in 1992.)
1989	Establishment of Lake Mohave Native Fish Work Group to implement cooperative actions for conservation of adult razorback sucker population in Lake Mohave.
1991	Razorback sucker listed as endangered under the ESA.
1992	Powerplant added to Headgate Rock Dam; maximum generating capacity is 19.5 megawatts.
1993	Hoover Dam power plant upgrade from 1,448-megawatt to 1,951-megawatt output completed. (Upgrade started in 1986.)
	Flood event occurred on Colorado River due to Gila River flooding.
1994	Areas of lower Colorado River designated as critical habitat for two endangered fish, bonytail and razorback sucker, under the ESA. Although not within the LCR MSCP planning area, critical habitat was designated on the LCR for humpback chub.
1995	Parker Division, Section II stabilized.
	Southwestern willow flycatcher listed as endangered under the ESA.
	Flood event occurred on Colorado River due to Gila River flooding.
1995	Partnership to develop and implement a long-term endangered species compliance and management program for the historic floodplain of the LCR formed by U.S. Department of Interior agencies; water, power, and wildlife resources agencies from Arizona, California, and Nevada; Native American tribes; water and power providers; environmental interests; and recreational interests.
1996	Reclamation issued final biological assessment for operations, maintenance, and sensitive species of LCR in August.
1997	USFWS issued a final biological opinion on LCR operations and maintenance in April.
2000	Reclamation issued biological assessment covering the Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on LCR Lake Mead to Southerly International Boundary.
2001	USFWS issued biological opinion on Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on LCR Lake Mead to the Southerly International Boundary.
	USFWS published draft recovery goals for humpback chub, razorback sucker, bonytail, and Colorado pikeminnow, setting forth numeric and management levels needed to downlist and delist these species under the ESA.
2002	USFWS published final recovery goals for humpback chub, razorback sucker, bonytail, and Colorado pikeminnow and published the *Southwestern Willow Flycatcher Recovery Plan*.
	Reclamation requested reinitiation of the 1997 consultation. USFWS issued an interim BO, which identified minor modifications to the provisions of its 1997 BO and extended coverage for Reclamation’s discretionary actions on the LCR for 3 years to April 30, 2005.
2004	The USFWS proposed critical habitat for the southwestern willow flycatcher including areas in the LCR MSCP planning area in October.

Sources: Bureau of Reclamation 1996, 2000a; U.S. Fish and Wildlife Service 2001, 2002a–e.

Water diversion for agricultural irrigation on the LCR began as early as 1877 in the Palo Verde Valley. The first water diversion project for large-scale agricultural use on the LCR was the Alamo Canal, which was completed in 1901. The canal delivered water to the Imperial Valley. Laguna Dam was constructed in 1909 near Yuma, Arizona, and was the first structure to block the entire river channel on the LCR. This structure diverted water to the Yuma Valley and the Reservation Division via the Yuma Main Canal and to the Gila Valley via the North Gila Canal.

The construction of the Hoover Dam and the AAC System altered the LCR significantly. Hoover Dam, which created Lake Mead, was constructed to control high flows and protect agricultural lands and facilities. Changes associated with Hoover Dam include sediment trapping, decreased productivity downstream of the dam, decreased water temperatures, increased water clarity downstream of the dam, elimination of large flood events, introduction of new species, and isolation of native fish populations (by impeding their migration). The AAC System includes the AAC, Coachella Canal, and Imperial Dam and Desilting Works. These canals transport waters away from the system, altering water flows.

Two additional large dams were constructed in the river: Parker Dam in 1938 and Davis Dam in 1953. The changes in environmental conditions associated with these dams are similar to those associated with Hoover Dam. Parker Dam created Lake Havasu and Davis Dam created Lake Mohave. These two dams further reduced riparian vegetation, reduced sediment transport, increased water clarity, and impeded fish movement. At the upstream end of Lake Havasu, a delta formed as sediment was deposited, creating Topock Marsh.

Smaller dams and other diversion structures built in the river include Imperial Dam, Headgate Rock Dam, Morelos Diversion Dam, and Palo Verde Diversion Dam. Imperial Dam created a large backwater and series of marsh complexes, inundating existing riparian vegetation.

Starting in the 1950s, levee, training structure, and jetty construction; bankline stabilization; and channel realignment were undertaken by Reclamation to control floods, regulate flows, and prevent bank erosion, among other purposes. Dredging was undertaken to realign the channel, control sediment, provide material for levee construction, and conduct environmental enhancement and mitigation. Levees that were constructed close to the main river channel restricted the floodplain and removed connections between the river and riparian vegetation, marshes, and backwaters. Narrower, straighter portions of the river channel were created by levee and training structure construction, bankline stabilization, and dredging. In addition, banks were protected from erosion by bankline stabilization and training structures. Increased water velocity in the narrow portions of the river channel eroded a formed channel as the fast-moving water eroded the bottom of the river. (U.S. Fish and Wildlife Service 1997; Bureau of Reclamation 2000a.)

In areas where channel deepening occurred, the water table lowered. Marshes and backwaters dried up. If the roots of riparian vegetation could reach to the lowered water table, the vegetation could survive; however, regeneration of riparian vegetation decreased. (U.S. Fish and Wildlife Service 1997.)

Though new backwaters and marshes are no longer likely to form naturally because of modifications to the river channel and flow regime, construction of training structures resulted in the formation of more expansive and permanent marshes than had existed historically. (Bureau of Reclamation 2000a.)

3.2.2 Loss of Riparian Vegetation and Floodplain

Agriculture contributed to changes on the floodplain along the LCR. Levee construction and water diversion associated with agricultural practices hindered floodwaters from reaching riparian, marsh, and backwater areas. Channelization and bankline stabilization altered erosion and flooding patterns, while water diversions decreased water levels, both contributing to the loss of native fishes. Though most agricultural development occurred in fertile valleys away from the river itself, some agricultural land was located along river terraces, replacing riparian vegetation, marshes, and backwaters.

Boat traffic added to the loss of riparian vegetation as steamboats used the riparian vegetation along the river for fuel.

Dams also contributed to the loss of riparian vegetation and floodplain. Large dams, such as Hoover, Parker, and Davis Dams, inundated miles of river, riparian areas, and adjacent desert areas.

Historically, approximately 400,000–450,000 acres of riparian vegetation were estimated to occur on the LCR between Fort Mohave and Fort Yuma (Mearns 1907). An analysis by Reclamation (1999) of 1938 aerial photography, historical journals, historical photographs, surveyor plats, and historical maps indicated the presence of approximately 89,200 acres of potentially suitable willow flycatcher breeding habitat between the Grand Canyon and the SIB (in the analysis, historical willow flycatcher habitat is defined as "dense willows often with an over story of cottonwood"). Currently, approximately 126,000 acres of woody riparian vegetation occurs in the LCR MSCP planning area, of which approximately 23,000 acres are native vegetation (the remainder is dominated by saltcedar). Regeneration of woody riparian vegetation has also decreased considerably because of loss of riparian vegetation to agricultural, residential, and commercial development and bankline stabilization; water table lowering because of channelization; and loss of seasonal flooding because of dam construction.

3.2.3 Changes in Marsh and Backwaters

Marsh and backwaters were lost from areas where they historically occurred because of agricultural conversion, construction of reservoirs, river channelization, and bankline stabilization. The natural formation of new marshes and backwaters because of river action is also now unlikely. However, flow regulation and shifts in the timing of flows because of water diversion resulted in large marsh and backwater complexes developing where riparian vegetation historically occurred. Marsh complexes developed behind Imperial Dam and Parker Dam at the Bill Williams Delta and Topock Marsh. The construction of training structures also created areas of more expansive and permanent backwater and marsh than had occurred historically on the LCR. In addition, some marshes have been created as mitigation for channel improvement projects. These improvement projects contributed to the elimination of overbank flows and river meandering that created the historical marsh and backwater communities. Reclamation maintains these marshes as well as marshes formed by the construction of training structures and other river control features. (U.S. Fish and Wildlife Service 1997; Bureau of Reclamation 2000a.)

3.2.4 Introduction of Nonnative Species

Nonnative species have been present in the river since the late 1800s. Carp and catfish were among the first fish species to be introduced in the river (Grinnell 1914). However, the extent of their presence was not completely documented. Other fish species introductions followed, including mosquitofish for mosquito control in the 1920s and 1930s, largemouth bass and other centrarchids (i.e., freshwater basses and sunfishes) in Lake Mead for sport fishing, and rainbow trout below Hoover Dam (where water clarity had increased) in the 1930s for sport fishing. Red shiners and threadfin shad were introduced for a sport fishing forage base in the 1950s; threadfin shad quickly spread throughout the LCR. Striped bass were introduced in the 1960s by the state game and fish agencies to take advantage of the thriving forage base; this species became a top fish predator in the Colorado River system. Flathead catfish were also introduced into the Colorado River in the 1960s. Fish from the genus *Tilapia* were introduced for weed control in the irrigation systems beginning in the 1960s. (Bureau of Reclamation 1996.)

In all, 29 nonnative fish species have become established in the river and are believed to be the primary reason for the lack of recruitment of native species because of predation and competition (Pacey and Marsh 1998). Native fish were adapted to the historical extremes of the LCR; nonnative fish were not. However, under postdam conditions, native fish had no competitive advantage over nonnative fish. Many of the nonnative fish species produced far more eggs per female than the native species, allowing them to quickly increase their numbers relative to native species. Introduced fish species invaded the off-channel habitats frequented by native fish, where they could compete for resources with and prey on the native fish, especially juveniles. In addition, the increase in water clarity downstream of dams may have given nonnative fish a predatory advantage. (Bureau of Reclamation 1996.)

Introduction of nonnative plants modified the riparian community and its wildlife habitat quality. Saltcedar, which was introduced into the United States as an ornamental tree, escaped cultivation by the late 1800s. Saltcedar appeared along the mainstem of the Colorado River in 1920 (Ohmart et al. 1988), though rapid expansion of its range along the river did not occur until 1935 to 1955 (DeLoach 1989). The substantial changes to the hydrology of the Colorado River favored saltcedar establishment, while limiting recruitment and persistence of cottonwood-willow communities. Important wildlife habitats, including cottonwood-willow gallery forests, all but disappeared from the Colorado River and were replaced by less desirable saltcedar (Anderson and Ohmart 1984a). Additional introduced plant species, such as giant reed and giant salvinia, are also contributing to the decline of native plant communities.

3.2.5 Water Quality Changes

Water quality changes within the LCR system have occurred because of irrigation return flows, M&I effluents, dam construction, and a number of point sources. The quality of irrigation return water has potential effects on wildlife and fish. Agricultural return flows have generally resulted in an increase in salinity in receiving water bodies because of salts leached from the irrigated soils. Irrigation return flows may also contain various residuals from fertilizers and pesticides. Typical inorganic contaminants include selenium, zinc, and copper (Buhl and Hamilton 1996). Dams trap sediment and nutrients, increasing downstream water clarity, and potentially decreasing downstream productivity. In addition, evaporation from reservoirs increases salinity concentration.

3.3 Baseline Conditions

This section describes the regulatory context for the baseline conditions and summarizes the present conditions of the LCR ecosystem. Major sources used to prepare this summary include:

- *Biological Assessment, Description and Assessment of Operations, Maintenance, and Sensitive Species of the Lower Colorado River* (Bureau of Reclamation 1996);
- *Biological and Conference Opinion on the Lower Colorado River Operations and Maintenance-Lake Mead to the Southerly International Boundary* (U.S. Fish and Wildlife Service 1997);
- *Resource Use by Native and Non-Native Fishes of the Lower Colorado River: Literature Review, Summary and Assessment of Relative Roles of Biotic and Abiotic Factors in Management of an Imperiled Indigenous Ichthyofauna* (Pacey and Marsh 1998);
- *Biological Assessment, Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary* (Bureau of Reclamation 2000a); and
- *Biological Opinion for Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary; Arizona, California and Nevada* (U.S. Fish and Wildlife Service 2001).

3.3.1 Regulatory Context

Existing conditions represent a “snapshot” in time of the status of populations and habitat of the covered species in the LCR MSCP planning area. This snapshot is used to assess the effects of the covered activities described in Chapter 2, “Description of Covered Activities,” on the covered species. Existing conditions include all effects of actions taken in the past, even if effects of some of the actions have not yet been fully manifested. This definition of the existing conditions is used because the current environmental conditions are derived in large measure from permanent artificial facilities (e.g., dams, jetties, training structures, protected banklines, levees) and annual river operations along the LCR. The effects of these permanent facilities on covered species are considered irreversible and are not appropriately considered an effect of the activities covered under the LCR MSCP HCP. Existing conditions along the LCR reflect the effects of past and ongoing human and natural factors leading to the current status of the covered and evaluation species, their habitat, and the ecosystem in the LCR MSCP planning area. Existing conditions are the existing extent of land cover types and abundance and distribution of species described in this chapter. Human factors considered part of existing conditions include the past and present effects of existing facilities (e.g., dams along the LCR), flood control infrastructure (e.g., levees, protected backlines), and ongoing operations and maintenance activities. The effects of natural factors, such as climate (e.g., flooding, drought, variation throughout the year in precipitation and temperature), topography, and riverbed composition, are also considered part of existing conditions along the LCR.

3.3.2 Present Conditions

Present conditions[1] in the LCR are significantly different from historical conditions. The river is no longer free flowing and does not constitute a continuous ecosystem because of the many impoundments along its length. In addition, the hydrologic regime does not support extreme fluctuations mainly because of the presence of large, mainstem dams farther upstream, resulting in reduced natural backwaters and reduced periods of inundation in adjacent floodplain lowlands.

The present condition consists of approximately 126,000 acres of woody riparian vegetation occurs in the LCR MSCP planning area. The majority is dominated by saltcedar (i.e., saltcedar, saltcedar–honey mesquite, and saltcedar–screwbean mesquite land cover types); only 23,000 acres are native cottonwood-willow, honey mesquite, arrowweed, and atriplex land cover types. See Appendix H for a summary of the current extent of native and nonnative vegetative cover in the LCR MSCP planning area by landownership status.

Reach 1 is defined by Hoover Dam to the full pool elevation of Lake Mead at 1,229 feet mean sea level (msl). Hoover Dam and Lake Mead were created to provide flood control, water storage for irrigation, and hydroelectric power. In addition to the Colorado River, Hoover Dam retains flows from the Muddy and Virgin Rivers. Lake Mead is characterized as a mesotrophic lake (i.e., intermediate in nutrient levels and productivity) (La Bounty and Horn 1997). Because of the construction of Glen Canyon Dam, most of the Colorado River sediment load is trapped in Lake Powell. Lake Mead, formed by Hoover Dam, traps Colorado River sediment from the Grand Canyon in its upper reaches, and the river downstream of the dam is relatively clear. Water temperatures downstream of the dam are cool because of releases from the hypolimnetic zone (deeper, cold-water layer) of the reservoir. Lake Mead supports a small recruiting population of razorback sucker, as well as a large number of nonnative fishes, many of which prey on native

[1] The extent of existing vegetation described in this Chapter is derived from aerial photographs taken of the LCR MSCP planning area from 1997 through 2001 and, consequently, represent the extent of vegetation types that were present at the time of the aerial photographs were taken and represent the best available information.

species of fish. Native fishes are unable to move upstream or downstream of the barrier created by the dam. Riparian vegetation along Lake Mead is limited because of lack of substrate and frequent water fluctuations in the reservoir. At the time vegetation was delineated in 1997, approximately 4,000 acres of woody riparian vegetation was present within the full pool elevation of Lake Mead 1,700 acres of which are native cottonwood-willow; the remainder are saltcedar or mixed saltcedar–mesquite). Approximately 140 acres of marsh occur in Reach 1.

Reach 2 extends from Hoover Dam to Davis Dam and is defined by the boundary of Lake Mohave to the full-pool elevation of 647 feet. Davis Dam and Lake Mohave were created to provide part of the capacity for water delivery to Mexico and to re-regulate fluctuating discharge from Hoover Dam. Additional sediments are trapped behind Davis Dam. The inflow to Lake Mohave is mostly discharge from Hoover Dam with some infrequent desert-wash flooding (Pacey and Marsh 1998). The river reach (Reach 2) from below Hoover Dam to Lake Mohave contains cold tailwater. Lake Mohave is clear but highly productive (Pacey and Marsh 1998). Like Lake Mead, Lake Mohave supports warm water and coldwater sport fisheries, as well as repatriated and remnant native fish populations of razorback sucker and bonytail. Approximately 1,200 acres of woody riparian vegetation, 5 acres of which are native cottonwood-willow and honey mesquite (the remainder are saltcedar or mixed saltcedar–mesquite), and 20 acres of marsh occur in Reach 2.

Reach 3 extends from Davis Dam to Parker Dam and is defined by the boundary of Lake Havasu to the full-pool elevation of 450 feet. Immediately below Davis Dam, the system is characterized by a riverine reach controlled by the cold water discharge from Davis Dam. Parker Dam and Lake Havasu were created mainly to provide a forebay and desilting basin for Metropolitan’s Whitsett Pumping Plant for the Colorado River Aqueduct (Pacey and Marsh 1998). The Topock Desilting Basin, located near Needles, California, was constructed to reduce the flow of sediment into Topock Gorge and is periodically dredged. Lake Havasu is a relatively shallow mesoeutrophic (i.e., tending toward high nutrient levels and high primary productivity) and warm-water impoundment with a complex shoreline. Topock Marsh, which came into existence because of the construction of Parker Dam and the filling of Lake Havasu, is located at the upstream end of Lake Havasu. The Bill Williams River empties into Lake Havasu (Pacey and Marsh 1998). Water is withdrawn from Lake Havasu by the CAP and Metropolitan. Lake Havasu supports sport fisheries of nonnative species and also the repatriated and potentially remnant native fish populations of razorback sucker and bonytail. More than 50 percent of the riverbank downstream of Davis Dam has been replaced with riprap (Minckley 1979). Reach 3 contains approximately 31,500 acres of woody riparian vegetation, approximately 2,700 acres of which are native cottonwood-willow, honey mesquite, arrowweed, and atriplex (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 4,400 acres of marsh.

Reach 4 extends from Parker Dam to Adobe Ruin and Reclamation’s Cibola Gage. This reach is channelized. Backwaters along this reach include Palo Verde Oxbow, Cibola Lake and Three Fingers Lake. The riverine portion of this reach includes the epilimnetic water (warm, surface water layer) released from Parker Dam. Diversions provide water to the agricultural lands along the floodplain and adjacent uplands; the main diversions are at Headgate Rock Dam and the Palo Verde Diversion Dam. River flows receive irrigation return flows and infrequent runoff (Pacey and Marsh 1998). The water temperature is warm and the river supports abundant nonnative fish populations. Approximately 65,700 acres of woody riparian vegetation, approximately 14,500 acres of which are native cottonwood-willow, honey mesquite, arrowweed, and atriplex (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 2,100 acres of marsh occur in Reach 4.

Reach 5 extends from southern extent of Cibola National Wildlife Refuge (NWR) and Reclamation's Cibola Gage to Imperial Dam. Imperial Dam created Imperial Reservoir and provides water to the Gila Gravity Main Canal in Arizona and the AAC in California. Generally, Imperial Reservoir is warm and shallow and acts as a desilting basin for the canal intakes (Pacey and Marsh 1998). The desilting works for the Gila Gravity Main Canal and AAC move sediment from above Imperial Dam to the Laguna Desilting Basin. In addition, dredging periodically occurs in the reservoir basin upstream of Imperial Dam to maintain diversions for the Gila Gravity Main Canal and AAC. Razorback suckers are also present in Reach 5. Reach 5 contains approximately 7,800 acres of woody riparian vegetation, approximately 800 acres of which are native cottonwood-willow, honey mesquite, and arrowweed (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 3,800 acres of marsh.

Reach 6 extends from Imperial Dam to the NIB and includes Laguna Dam, Mittry Lake, and the confluence with the Gila River. The Laguna Desilting Basin, which receives sediment from upstream sources, is periodically dredged. Flows in Reach 6 are minimal, consisting of water resulting from sluicing operations at Imperial Dam and irrigation return flows. The fish fauna is dominated by nonnative species. Reach 6 contains approximately 12,200 acres of woody riparian vegetation, approximately 2,600 acres of which are native cottonwood-willow, honey mesquite, *Atriplex*, and arrowweed (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 1,400 acres of marsh.

Reach 7 includes only the LCR floodplain within the United States extending from the NIB to the SIB and includes Morelos Diversion Dam. Morelos Diversion Dam provides water for the Mexican canals, leaving little water to be carried to the river delta at the Gulf of California. River conditions below Morelos Diversion Dam to the SIB are frequently dry, or nearly so. Flow, when present, in this reach is maintained by seepage and releases from Morelos Diversion Dam, irrigation return flows, canal wasteway discharges, and groundwater discharge. Considerable sediment was deposited in this reach during the 1993 Gila River flooding. To maintain flow capacity for flood events in the river channel, periodic dredging is expected to occur between the NIB and Cocopah Bend. Reach 7 contains approximately 3,700 acres of woody riparian vegetation, approximately 800 acres of which are native cottonwood-willow, arrowweed, and atriplex (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 130 acres of marsh.

3.4 Land Cover Types Used for Species Habitat Models

With the exception of the southwestern willow flycatcher, covered species habitats have not been directly field delineated in the LCR MSCP planning area. Therefore, for some covered and evaluation species, species habitats are defined by application of species habitat models based on the likelihood for each land cover type to support a species habitat (Section 3.5.1.1, “Species Habitat Models). For these species, the analysis of the extent of their habitat begins with a definition of the land cover types used for the species models.

The land cover type classification system used in the LCR MSCP was derived from previous classifications developed by Anderson and Ohmart (1984b), Younker and Anderson (1986), Salas et al. (1996), and Ogden Environmental and Energy Services (1998). Fourteen land cover types are described in the LCR MSCP planning area (Table 3-2). Five woody riparian land cover types are divided into multiple structural types, and the marsh land cover type is divided into seven compositional types based on plant composition and vegetation structure.

Table 3-2. Land Cover Type Classification used in Mapping Resources of the LCR MSCP Planning Area

Woody riparian land cover types
Cottonwood-willow (six structural types)
Saltcedar (six structural types)
Honey mesquite (four structural types)
Saltcedar–honey mesquite (four structural types)
Saltcedar–screwbean mesquite (five structural types)
Arrowweed
Atriplex
Marsh land cover type (seven compositional types)
Aquatic land cover types
River
Reservoir
Backwater
Adjacent land cover types
Desert scrub
Agriculture
Developed

3.4.1 Woody Riparian Land Cover Types

Woody riparian land cover types are classified by plant community and structural type (Anderson and Ohmart 1984b). Criteria used to define woody riparian land cover types are presented in Table 3-3. Six structural types have been described (I–VI) and reference is made to the proportion of foliage present in each of three vertical layers. For example, a plant community with structural type VI has most of its foliage in the lowermost layer, less foliage in the mid-height layer, and little or no foliage in the upper canopy. A structural type I community has well-developed foliage in all three layers, with the upper canopy dominating. Figure 3-1 and Table 3-4 describe the relationship between the six structural types and the foliage density at various heights. Numerical dominance can be shared by more than one species, as long as each species constitutes at least 5 percent of the total trees present (Anderson and Ohmart 1984b).

Table 3-3. Woody Riparian Land Cover Types and Characteristics Used in Classification

Habitat Type	Characteristics
Cottonwood-willow	*Salix gooddingii* and *Populus fremontii* (the latter usually in low densities) constituting at least 10 percent of total trees (remaining trees are usually saltcedar).
Saltcedar	*Tamarix* spp. constituting 80–100 percent of total trees.
Honey mesquite	*Prosopis glandulosa* constituting 90–100 percent of total trees.
Saltcedar–honey mesquite	*Prosopis glandulosa* constituting at least 10 percent of total trees; rarely found to constitute more than 40 percent of total trees.
Saltcedar–screwbean mesquite	*Prosopis pubescens* constituting at least 20 percent of total trees.
Arrowweed	*Pluchea sericea* constituting 90–100 percent of total vegetation in area.
Atriplex	*Atriplex lentiformis*, *A. canescens* and/or *A. polycarpa* constituting 90–100 percent of total vegetation in area.

Source: Anderson and Ohmart 1984b.

Table 3-4. Description of Woody Riparian Land Cover Structural Types

Type I	Mature stand with distinctive overstory more than 15 feet tall; intermediate class is 2–15 feet tall and understory is 0–2 feet tall.
Type II	Overstory is more than 15 feet tall and constitutes more than 50 percent of the trees; little or no intermediate class present.
Type III	Largest proportion of trees is 10–20 feet tall; few trees above 20 feet or below 5 feet tall.
Type IV	Few trees above 15 feet tall; 50 percent of the vegetation is 5–15 feet tall and 50 percent is 1–2 feet tall.
Type V	60–70 percent of the vegetation is 0–2 feet tall, the remainder is 5–15 feet tall.
Type VI	75–100 percent of the vegetation is 0–2 feet tall.

Source: Anderson and Ohmart 1984b.

3.4.1.1 Cottonwood-Willow

This community comprises winter-deciduous, broadleaf trees that grow to about 60 feet tall (Holland 1986; Rowlands et al. 1995). The dominant tree species are Fremont cottonwood and Goodding's willow, although other willow species may be present. The community occurs in deep, well-watered, loamy alluvial soils along the floodplain of the Colorado River and major tributaries (Holland 1986). To be maintained, it requires periodic winter or spring flooding that creates new silt beds for seed germination of the dominant species. Both Fremont cottonwood and Goodding's willow reproduce primarily by seed and have narrowly defined germination requirements. In addition, neither species can tolerate prolonged inundation (Ohmart et al. 1988; Brown 1994). Postdam stabilized flows along the Colorado River are not conducive to seed germination for these species. As a result, stands of cottonwood-willow that remain along the mainstem are largely decadent and show little evidence of seedling recruitment (Brown 1994).

The cottonwood-willow land cover type includes areas where Fremont cottonwood and Goodding's willow comprise at least 10 percent of the total trees (Younker and Andersen 1986). The canopy ranges from continuous to open, and the ground layer is variable. Cottonwoods typically are present in far smaller amounts than are willows. The majority of remaining trees is usually saltcedar.

3.4.1.2 Saltcedar

Saltcedar is the common name applied to several nonnative species of shrubs to medium-size trees of the genus *Tamarix* that have increased in abundance over the last 50 years, while the extent of native riparian vegetation has declined along the Colorado River. The most commonly invasive species are *Tamarix chinensis*, *T. parviflora*, and *T. ramosissima*. The related "athel," a larger tree that has been widely planted in the LCR MSCP planning area, may also be included in areas mapped as saltcedar. This association generally occurs as a monoculture of saltcedar shrubs or trees. Saltcedar occurs over the entire range of soil conditions found along the LCR, including areas where lack of flooding and high evaporation allow salts to build up in soils. Saltcedar is also a prolific seeder and, although the seed remains viable for only a few weeks, it is produced over a long period (March through October) relative to native riparian species. The seeds are minute and readily dispersed long distances by wind and water (DeLoach et al. 2000; Lovich 2000). Germination and establishment occur on open sites where soil moisture is high for a prolonged period. The operation of dams along the Colorado River results in stabilized low flows and regular summer flooding of river bars, providing ideal conditions for the establishment of saltcedar (Turner and Karpiscak 1980). Subsequent growth is extremely rapid and tends to preclude the establishment of native riparian species on such sites (Ohmart et al. 1988; Lovich 2000).

Saltcedar has replaced the native woody riparian associations along much of the river, particularly in areas where the native vegetation has been cleared or removed by fire (Brown 1994; Turner and Karpiscak 1980; Ohmart et al. 1988). Saltcedar is able to persist in highly saline soils that are not conducive to the establishment and growth of cottonwood and willow. Saltcedar's consumptive water use in the planning area ranges from 57.3 to 58.4 inches per year, as compared to a range of 56.2–57.4 inches per year for cottonwood-willow, 56.5–58.0 inches per year for mesquite, and 53.1–54.2 inches per year for arrowweed/atriplex (Bureau of Reclamation 2000b). Saltcedar takes up and excretes salts, increasing soil salinity, and it increases fire frequency by producing large amounts of litter (DeLoach et al. 2000).

The saltcedar land cover type is dominated by nearly monotypic stands of saltcedar that are less than 16-feet tall. Saltcedars comprise approximately 80–100 percent of the total trees in this category (Younker and Andersen 1986), and the cover may be continuous or open. Because of its pervasive nature, saltcedar is found interspersed within every other riparian land cover type. Patches of arrowweed as large as 5 acres may be included in saltcedar land cover areas (Younker and Andersen 1986) and the ground layer is typically sparse.

3.4.1.3 Honey Mesquite

Historically, honey mesquite land cover type occurred on the broad alluvial floodplains of the Colorado River, on secondary and higher terraces above the main channel. Honey mesquite, the dominant species in this association, is a facultative upland plant with the potential to occur in both upland and wetland areas (Reed 1988). It is also a facultative phreatophyte that has adapted to avoid water stress through several mechanisms, including a long taproot that is able to reach deep water tables (Nilsen et al. 1983; Ohmart et al. 1988). Riparian honey mesquite has high productivity, which results from several physiological and morphological adaptations that allow them to “decouple” from the normal limitations on water and nutrient resources in desert systems (Nilsen et al. 1983). Foremost, a deep root system allows mesquite to tap water sources unavailable to shallower rooted plants, while association with nitrogen-fixing symbionts releases mesquite from nitrogen limitation (Stromberg 1993a).

This species cannot tolerate even relatively short inundations during the growing season and, prior to river regulation by dams, became established on infrequently flooded terraces at some distance from the river. The acreage of honey mesquite has been decimated as these floodplain terraces have been converted to agriculture. Although regulation of the river has enabled honey mesquite to colonize areas that are closer to the river, it is vulnerable to replacement by saltcedar. Flooding, vegetation clearing between the levees, and increased fire frequency (promoted by saltcedar), can eliminate honey mesquite, which does not colonize or reestablish in open areas as readily as saltcedar (Minckley and Brown 1982; Ohmart et al. 1988).

Honey mesquite often forms monotypic stands of trees that are less than 30 feet in height. It can also grow interspersed with or as a mosaic with shrubby species, such as arrowweed, quail bush, fourwing saltbush, allscale, wolfberry, or inkweed, among others. Shrub associates are typically in openings in the canopy rather than forming a true understory. The coverage of honey mesquite is generally 90–100 percent of the total vegetation in the mapped area (Younker and Andersen 1986). The canopy can be continuous or open, and the ground layer is typically sparse or grassy.

3.4.1.4 Saltcedar–Honey Mesquite

As described above, honey mesquite often occurs in monotypic stands along the Colorado River or is present in a mosaic association with shrubby species. Representative examples of mixtures of saltcedar and honey mesquite occur at Cibola NWR and Fort Mohave Indian Reservation. In these areas, saltcedar is present as a dense understory layer and honey mesquite forms a well-developed, relatively open canopy layer (Ohmart et al. 1988).

Saltcedar dominates this land cover type; however, honey mesquite constitutes at least 10percent, but rarely more than 40 percent, of the total trees (Younker and Andersen 1986). The formation of saltcedar–honey mesquite stands reflects the ability of saltcedar to rapidly establish and become dominant in relatively open or senescent stands of mesquite. The greater vulnerability of mesquite to fires, floods, and increased salinity, coupled with the greater recruitment of saltcedar, indicates the gradual loss of honey mesquite and the replacement of the mixed association with a monoculture of saltcedar (Ohmart et al. 1988). Shrubby species, such as arrowweed or quail bush, or widely scattered individuals or clumps of screwbean mesquite may also be present, but unlike saltcedar, these native species do not establish in abundance as an understory of honey mesquite.

3.4.1.5 Saltcedar–Screwbean Mesquite

Although screwbean mesquite occurred historically along the LCR, it was relatively scarce (Ohmart et al. 1988) and restricted to older portions of the riverbed or backwater areas before stabilization or channelization of the river. As documented by Ohmart et al. (1988), after the closure of Parker Dam, from 1938–1960, screwbean mesquite experienced significant increases in cover downstream. Recruitment and growth of screwbean mesquite were evidently favored by the curtailment of spring flooding and the stabilization of summer low flows, while these changes in the hydrograph had the opposite effect on cottonwood-willow vegetation. Between 1960 and 1976, with the expansion of agriculture on Tribal lands and the loss of riparian vegetation within the floodplain, the total cover of screwbean mesquite decreased. In the years following 1976, screwbean mesquite has continued to decline, primarily because of replacement by saltcedar. The circumstances that favored the expansion of screwbean mesquite along the river are no longer operating, apparently because the open sites that would otherwise provide recruitment opportunities are now rapidly colonized and effectively preempted by saltcedar (Ohmart et al. 1988).

Within the LCR MSCP planning area, screwbean mesquite is always found in association with saltcedar. This association reflects the ongoing expansion of saltcedar and its displacement of screwbean mesquite along the LCR (Ohmart et al. 1988; DeLoach et al. 2000).

While the primary criterion for saltcedar–screwbean mesquite cover type is that screwbean mesquite constitutes at least 20 percent of the total trees in the category, much of the acreage is typically dominated by saltcedar (Younker and Andersen 1986). Widely scattered clumps of individual cottonwood, willow, or honey mesquite trees may also be present.

3.4.1.6 Arrowweed

The arrowweed land cover type historically formed dense, monotypic, linear belts or small stands of vegetation along drier portions of the Colorado River floodplain, adjacent to stands of cottonwood-willow (Ohmart et al. 1988). It is still characterized by nearly monotypic stands of arrowweed within the riverine corridor. In addition to this location, it is found along canyon bottoms and irrigation ditches, around springs, and in washes with sandy or gravelly channels (Holland 1986; Brown 1994; Sawyer and Keeler-Wolf 1995).

Arrowweed reproduces both by seed and vegetatively. The seeds (achenes) are tiny (less than 0.04 inches) and have small bristles that facilitate their dispersal (McMinn 1939). Establishment from seed occurs on newly exposed, damp alluvial soils. Once established, arrowweed spreads laterally by underground rhizomes, forming continuous stands that tend to inhibit the establishment of other riparian species and remain dominant in the absence of disturbance. Arrowweed shoots withstand moderate flooding, and although they are unable to withstand strong scouring from floods, they recolonize open alluvial deposits readily by resprouting from roots and buried stems (Stromberg et al. 1991). Arrowweed survives at greater water table depths and tolerates greater soil salinities than Fremont cottonwood or Goodding's willow (Ohmart et al. 1988; Busch and Smith 1995). As a result, it has replaced cottonwood-willow vegetation in some areas that are subject to groundwater pumping (Holland 1986). However, it has been displaced by saltcedar in other areas (Turner and Karpiscak 1980).

3.4.1.7 Atriplex

This land cover type occurs locally in relatively undisturbed, saline portions of the LCR corridor. Spatially, it is often found between stands of cottonwood-willow or saltcedar and stands of mesquite (Ohmart et al. 1988; Brown 1994). This land cover type can include one or several atriplex species, including quail bush, fourwing saltbush, and allscale. Atriplex species compose 90–100 percent of the total vegetation in this category (Younker and Andersen 1986). This land cover type is typified by quail bush, which is a phreatophyte that is tied to the riparian corridor along the LCR. The other saltbush species are nonphreatophytic and, in the absence of quail bush, are better classified under desert scrub.

3.4.2 Marsh Land Cover Type

The marsh land cover type is classified into seven different types based primarily on the percent cover of cattail, bulrush, common reed, and open water (Younker and Anderson 1986) (Table 3-5). Marsh vegetation occurs in areas of prolonged inundation where long-term flooding persists. Historically, it was found along oxbow lakes and in backwater areas. Today, it also occurs around relatively stable reservoirs that have minimal daily and annual fluctuations in water level (Ohmart et al. 1988, Brown 1994). The most common components of this association are cattail, bulrush or tule, and common reed (Ohmart et al. 1988). Cattails occur in shallow water up to 3 feet deep and are found on sloping, generally stable substrates. Bulrushes (particularly, *Scirpus californicus*) can grow adjacent to cattails but in deeper water. They are found in water as deep as 5 feet, and can extend as high as 10 feet above the water surface. Thick stands of bulrushes occur on unmodified banks. Common reed can also form dense stands along the banks (Ohmart et al. 1988; Brown 1994).

Table 3-5. Marsh Land Cover Types and Characteristics Used in Classification

Type	Characteristics
1	Nearly 100 percent cattail/bulrush; small amounts of *Phragmites australis* (common reed) and open water.
2	Nearly 75 percent cattail/bulrush; many trees and grasses interspersed throughout cover.
3	About 25–50 percent cattail/bulrush; some *Phragmites australis*, open water, trees, and grass.
4	About 35–50 percent cattail/bulrush; many trees and grasses interspersed throughout cover.
5	About 50–75 percent cattail/bulrush; few trees and grasses interspersed throughout cover.
6	Nearly 100 percent *Phragmites australis*; little open water.
7	Open marsh (75percent water) adjacent to sparse marsh vegetation; sandbars and mudflats visible when Colorado River is low.

Source: Anderson and Ohmart 1984b.

This land cover type consists primarily of cattail/bulrush associations, although stands of common reed are also included (Anderson and Ohmart 1984b). These marsh elements typically intermingle with riparian scrub species (e.g., saltcedar, arrowweed, quail bush, mesquite) at their upper-elevation limits (Brown 1994). Marsh includes open water, sandbars, and mudflats formed when the Colorado River is low (Salas et al. 1996).

3.4.3 Aquatic Land Cover Types

Aquatic land cover types encompass areas that typically contain open water part or most of the year. Three aquatic land cover types are recognized: river, reservoir, and backwater.

3.4.3.1 River

The river land cover type includes the mainstem of the LCR and tributaries, including natural and artificial (i.e., canals and drains) channels within the LCR MSCP planning area. The criterion for inclusion in this category is the presence of flowing water throughout the year or most of the year. The river land cover type includes channel type (e.g., riffle, run, pool), cover (e.g., instream woody material, emergent and submerged vegetation), and substrate (e.g., sand, gravel, concrete lined).

During periods of overbank flooding, the river inundates parts of its floodplain and provides habitat values associated with inundated vegetation. Historically, substantial floodplain area was inundated by the high river flows following winter and summer storms and during the spring and early summer runoff (Minckley 1979). Under existing conditions, the river is constrained by reservoir operations, levees, and channelization, but higher flows during some seasons and years may inundate limited floodplain area. Flooded riparian areas provided temporary rearing habitat for fish and other aquatic species.

3.4.3.2 Reservoir

Storage reservoirs have substantial water storage as an operational element and include Lake Mead, Lake Mohave, Lake Havasu, and Senator Wash Reservoir. Diversion Reservoirs primarily provide stage control for gravity diversions and include the backwater pools at Headgate Rock Dam, Palo Verde Diversion Dam, Imperial Dam, Laguna Dam, and Morelos Diversion Dam.

3.4.3.3 Backwater

Backwaters more or less represent the open water elements of the pre-dam Colorado River channel and associated floodplain. Under existing conditions, backwaters include oxbow lakes, abandoned river channel pools, floodplain ponds and lakes, secondary river channel pools, and hydrologically isolated coves on reservoirs. Backwaters may be remnant features historically created by river processes or may be man-made. Backwaters may be permanent or temporary, drying completely during some seasons or years. Connections with the river may be open or in various degrees of closure, connected to the river by culverts, weirs, porous dikes, and groundwater. They can vary in size from less than 1 acre to more than 100 acres.

3.4.4 Adjacent Land Cover Types

Land cover types adjacent to riparian and aquatic land cover types in the LCR MSCP planning area include desert scrub, agricultural, and developed.

3.4.4.1 Desert Scrub

The desert scrub land cover type encompasses a variety of plant communities that can be distinguished on the basis of dominant species or combinations of species (e.g., creosote-bursage), as well as different microhabitats (e.g., desert wash woodland). Except for agricultural and developed areas (see below), the river channel and floodplain in the planning area are surrounded by desert scrub.

3.4.4.2 Agriculture

The agriculture land cover type includes both fallow and actively cultivated areas. Agricultural lands are concentrated in several wide, low-lying valleys along the LCR.

3.4.4.3 Developed

This land cover type includes urbanized areas and areas that have been graded or otherwise altered with the effect that they are not expected to support any natural vegetation other than ornamental and ruderal species. In addition to cities and towns, this category includes rural residences and buildings, campgrounds, golf courses, and parks and other landscaped areas. The most extensive areas of developed land in or near the LCR MSCP planning area include Laughlin, Bullhead City, Needles, Lake Havasu City, Parker and the Parker Strip, Blythe, and Yuma.

3.4.5 GIS Land Cover Database

The land cover geographic information systems (GIS) database was developed to provide a complete coverage of the entire LCR MSCP planning area. This database was used to identify the existing extent and distribution of land cover types in the LCR MSCP planning area. Habitat models for covered species were developed and applied to the land cover GIS database to estimate the extent and distribution of habitat for each covered species for which these data were suitable (Section 3.5.1.1, “Species Habitat Models”). With the exception of backwaters, all of the land cover types listed above are delineated in the GIS database. The backwaters land cover type is not delineated separately in the GIS database; rather, it is encompassed within the river and marsh land cover types.

The land cover GIS database was assembled using several previously developed GIS databases:

- Reclamation’s GIS database of land cover types within the riparian corridor of the LCR (Bureau of Reclamation 1997, supplemented in 2002),
- BIA’s database of land cover types on potentially irrigated reservation lands (Bureau of Indian Affairs 2001),
- Lower Colorado River Accounting System (LCRAS) GIS database of irrigated agricultural lands (Bureau of Reclamation 2001a), and
- LCRAS phreatophyte inventory (Bureau of Reclamation 2001b).

The dates and precision of the mapping efforts described above are presented in Table 3-6. The extent of mapping is the LCR MSCP planning area. Because there is overlap among the databases used to develop the LCR MSCP planning area land cover map and because the databases are of differing resolution and accuracy, the LCR land cover GIS database was created by applying priority levels to these databases. The databases were applied in the following priority order:

- 1st Priority—BIA database (it has the highest level of accuracy for potentially irrigated reservation lands but makes up only 4 percent of the GIS database),
- 2nd Priority—LCRAS irrigated lands database (it has the highest level of accuracy for irrigated agricultural lands in the LCR MSCP planning area and makes up 37 percent of the GIS database; however, it has a lower level of accuracy than the BIA database for potentially irrigated reservation lands),
- 3rd Priority—Reclamation database (it has a lower level of accuracy than the BIA database for potentially irrigated reservation lands and the LCRAS irrigated lands database for irrigated agricultural lands but has the greatest extent of coverage, making up 55 percent of the GIS database), and
- 4th Priority—LCRAS phreatophyte database (it has the lowest level of resolution but covers some areas that the other databases do not; it makes up 4 percent of the GIS database).

Table 3-6. Date and Precision of GIS Databases Used to Prepare and Assemble the LCR MSCP Land Cover Type GIS Database and Map

GIS Database	Date of Imagery Mapped	Scale of Imagery	Minimum Mapped Unit (acres)
Bureau of Reclamation	1997	1:24,000	1
Bureau of Indian Affairs	1997–2001	1:24,000	1
Lower Colorado River Accounting System (irrigated lands)	2001	1:24,000	1
Lower Colorado River Accounting System (phreatophyte inventory)	2001	1:24,000	2.5

GIS = geographic information systems.

The distribution of land cover types in the LCR MSCP planning area by river reach is presented on Figures 3-2–3-8. The land cover GIS database contains a greater level of classification detail than is presented on these map figures. These maps combine several land cover types (Table 3-7) and do not include woody riparian land cover structural type categories or marsh land cover subtypes. Table 3-8 presents the extent of each land cover type by river reach, including the extent of cottonwood-willow, marsh, saltcedar, and mesquite land cover types by structure class. The extent of land cover type by reach and landowner is presented in Appendix H.

Table 3-7. Land Cover Type Legend for Figures 3-2 through 3-8

Figure Land Cover Category	LCR MSCP Land Cover Types
Cottonwood-willow	Cottonwood-willow
Saltcedar	Saltcedar, saltcedar–screwbean mesquite, saltcedar–honey mesquite
Marsh	Marsh
Other riparian	Arrowweed, atriplex, honey mesquite, undetermined riparian (from LCRAS phreatophyte database)
Open water[a]	River Reservoir
Desert scrub	Desert scrub
Agriculture	Agricultural
Developed	Developed

[a] The backwater land cover type is not included in figures.

LCRAS = Lower Colorado River Accounting System.

3.5 Status of Covered and Evaluation Species Habitats in the LCR MSCP Planning Area

As described in Chapter 1, "Introduction," the MSCP HCP addresses 27 covered species for which incidental take authorization for implementing the covered activities described in Chapter 2, "Description of Covered Activities," is sought under section 10(a)(1)(B) of the ESA. In addition, the MSCP HCP addresses four evaluation species for which coverage under the section 10(a)(1)(B) permit could be proposed in future years (Table 1-2). Detailed descriptions of the ecological requirements and status of covered species are provided in Appendix I.

The LCR MSCP HCP uses a habitat-based approach for compliance with section 10(a)(1)(B) of the ESA. To implement this approach, habitat models were developed for applicable covered species, and the results of the application of these models were used in the assessment of impacts and development of the LCR MSCP Conservation Plan. This section defines habitat for each of the covered and evaluation species and describes the extent of existing habitat in the LCR MSCP planning area for species for which such information is available.

3.5.1 Covered and Evaluation Species Habitats

Based on the best available information about the known or potential distribution of covered and evaluation species habitat in the LCR MSCP planning area, species habitats are defined either by:

Table 3-8. Extent of Land Cover Type by River Reach

	Extent of Land Cover Type by River Reach (acres)[b]							
Land Cover Type[a]	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Total
Cottonwood-willow I	617	1	677	47	66	219	67	1,693
Cottonwood-willow II	32	0	13	25	2	7	1	81
Cottonwood-willow III	518	0	722	414	465	570	284	2,974
Cottonwood-willow IV	507	0	61	297	63	428	147	1,503
Cottonwood-willow V	46	0	42	31	3	61	127	309
Cottonwood-willow VI	2	0	26	75	16	40	49	209
Total cottonwood-willow	**1,721**	**1**	**1,541**	**889**	**616**	**1,325**	**675**	**6,768**
Saltcedar I	0	0	286	7	23	35	3	355
Saltcedar II	0	0	3	3	0	10	0	15
Saltcedar III	1,179	57	106	402	174	101	7	2,026
Saltcedar IV	680	626	8,122	14,821	4,530	4,455	898	34,132
Saltcedar V	304	144	4,172	8,358	500	915	999	15,392
Saltcedar VI	91	11	959	3,332	354	741	892	6,380
Total saltcedar	**2,254**	**838**	**13,647**	**26,923**	**5,581**	**6,257**	**2,800**	**58,300**
Honey mesquite III	0	0	0	689	0	1	0	690
Honey mesquite IV	0	4	545	4,815	148	4	0	5,517
Honey mesquite V	0	0	81	873	26	0	0	980
Honey mesquite VI	0	0	0	66	0	0	0	66
Total honey mesquite	**0**	**4**	**627**	**6,443**	**175**	**5**	**0**	**7,253**

Land Cover Type[a]	Extent of Land Cover Type by River Reach (acres)[b] Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Total
Saltcedar–honey mesquite III	3	3	400	81	41	22	2	553
Saltcedar–honey mesquite IV	10	356	1,278	8,169	725	128	0	10,667
Saltcedar–honey mesquite V	5	0	1,431	4,580	11	83	0	6,110
Saltcedar–honey mesquite V	40	0	354	568	0	1	0	963
Total saltcedar–honey mesquite	**58**	**359**	**3,463**	**13,398**	**778**	**234**	**2**	**18,293**
Saltcedar–screwbean mesquite I	0	0	0	10	0	0	0	10
Saltcedar–screwbean mesquite III	0	0	271	333	24	49	0	677
Saltcedar–screwbean mesquite IV	0	28	3,769	3,210	488	691	49	8,235
Saltcedar–screwbean mesquite V	0	4	625	896	67	25	0	1,617
Saltcedar–screwbean mesquite VI	0	0	393	204	0	21	0	619
Total saltcedar–screwbean mesquite	**0**	**32**	**5,058**	**4,654**	**579**	**786**	**49**	**11,159**
Arrowweed	0	0	496	6,541	48	1,069	48	8,201
Atriplex	0	0	19	582	0	177	121	899
Marsh 1	14	0	2,188	541	1,010	490	3	4,246
Marsh 2	0	0	235	116	289	11	0	651
Marsh 3	24	0	205	710	1,419	538	6	2,902
Marsh 4	15	0	1,013	464	496	90	6	2,084
Marsh 5	74	0	484	66	206	9	0	839
Marsh 6	0	0	101	29	315	146	15	606
Marsh 7	10	22	116	102	26	75	99	450
Unspecified marsh	0	0	18	62	0	56	0	136
Total marsh	**137**	**22**	**4,358**	**2,091**	**3,762**	**1,414**	**129**	**11,914**

	Extent of Land Cover Type by River Reach (acres)[b]							
Land Cover Type[a]	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Total
River[c]	660	1	5,764	6,918	2,797	887	140	17,167
Reservoir[c]	155,916	27,357	17,981	1,226	1,837	615	9	204,942
Desert scrub	353	31	7,676	11,710	397	3,151	129	23,447
Agriculture	0	0	19,166	169,664	260	36,799	44,705	270,594
Developed	1	0	6,391	32,722	0	10,205	14,307	63,626
Undetermined riparian[d]	0	0	6,634	6,268	0	2,337	13	15,252
Total	**161,100**	**28,645**	**92,820**	**290,029**	**16,831**	**65,262**	**63,127**	**717,814**

Note: Columns and rows may not total correctly because numbers were totaled, then rounded.

Sources:

[a] The extent of all land cover types, except undetermined riparian and unspecified marsh, are from Bureau of Reclamation 1997 (supplemented in 2002); the extent of all land cover types except river, reservoir, marsh, and undetermined riparian are from Bureau of Indian Affairs 2001; the extent of reservoir, marsh, cottonwood-willow, undetermined riparian and desert scrub are from the Lower Colorado River Accounting System (LCRAS) phreatophyte database (Bureau of Reclamation 2001a); and agriculture is from the LCRAS phreatophyte and irrigated lands databases (Bureau of Reclamation 2001b).

[b] Reach 1 data are from Bureau of Reclamation 1997 (supplemented in 2002) data only. Reach 2 data are from Bureau of Reclamation 1997 (supplemented in 2002) and the Lower Colorado River Accounting System phreatophyte database (Bureau of Reclamation 2001b) data only.

[c] The acreages shown for the river and reservoir land cover types include the backwater land cover type. The backwater land cover type is not included as a separate land cover type in the LCR MSCP GIS database.

[d] The *undetermined riparian* land cover type are riparian land cover types described in the LCRAS phreatophyte database that cannot be correlated to the LCR MSCP land cover types. The LCRAS riparian land cover types included in this table as *undetermined riparian* are saltcedar-low, saltcedar-high, mesquite-low, mesquite-high, saltcedar-mesquite, saltcedar-arrowweed, low vegetation, mesquite-arrowweed, and saltcedar-mesquite-arrowweed. Because *undetermined riparian* cannot be correlated to the LCR MSCP land cover types, they are not included in the species habitat models described in Section 3.5.1.1. The analysis of the impacts of covered activities in Chapter 4, however, indicates that mapped patches of *undetermined riparian* land cover will not be affected be affected by flow- or non-flow-related covered activities. Consequently, the inclusion of this land cover type category does not affect the analysis of the impacts of covered activities on covered species habitats presented in Chapter 4.

- application of species habitat models based on the likelihood for each land cover type to support a species habitat (22 species),
- delineation of actual habitat within the LCR MSCP planning area (one species), or
- known occurrences and habitat requirements for species whose habitats cannot be reasonably correlated to land cover types (eight species).

3.5.1.1 Species Habitat Models

With the exception of the southwestern willow flycatcher, covered species habitats have not been directly field delineated in the LCR MSCP planning area. To prepare the LCR MSCP HCP, habitat models have been developed for 22 covered species whose habitats can reasonably be correlated to the physical and biological attributes associated with each of the LCR MSCP land cover types. Habitat models are based on the land cover types described in Section 3.4, “Land Cover Types Used for Species Habitat Models,” and that were used to construct the LCR MSCP GIS land cover database.

The models define habitat for each covered species as the LCR MSCP land cover types that would be most likely to encompass the elements of each covered species’ habitat (Appendix I, “Status of LCR MSCP Covered Species”) within the river reaches where each species is known or expected to occur based on known habitat requirements for the species. For each species, the existing distribution of habitat, assessment of impacts on covered species habitat, and assessment of expected outcomes of implementing the covered activities with LCR MSCP conservation measures is based on application of these models. Species habitat models are presented in Table 3-9. The calculated extent of existing habitat for each species by land cover type and by river reach in the LCR MSCP planning area is presented in Tables 3-10 and 3-11, respectively. Recent occurrences of these species in the LCR MSCP planning area are presented on Figures 3-9a–d; critical habitat and occurrence of razorback sucker and bonytail are presented on Figure 3-10a and 3-10b.

To construct the species habitat models, biologists identified the basic components of habitat for each species from a literature review. The habitat models are based only on the components of each covered species habitat that are related to vegetation communities (e.g., dominant plant species, canopy height). Only those vegetation communities clearly identified as providing frequently used relatively high quality habitat for a species are included in that species habitat model; however, it was recognized that other vegetation communities might be used by the species at a lesser frequency. The LCR MSCP land cover types that included the vegetation communities identified as providing high quality habitat for a covered species were assumed to provide habitat for that species. These models were the subject of the independent peer review process, and were determined suitable for use in the impact analysis and development of conservation measures (see Chapter 10). The extent of existing habitat in the LCR MSCP planning area for a covered species was determined by summing the extent of land cover types that provide habitat for a species in each of the reaches where the species is known or expected to occur based on known habitat requirements for the species.

Because these habitat models only consider the components of covered species habitats that are related to the general physical and biological attributes of vegetation communities, application of these habitat models overestimates the extent of habitat present in the LCR MSCP planning area. For example, mature cottonwood-willow forests provide habitat for the yellow-billed cuckoo and it is assumed that all patches of cottonwood-willow types I–III provide habitat. Consequently, even though as few as 10 percent of the trees present in patches of cottonwood-willow types I–III (see Table 3-3) may be cottonwood or willow (the remainder of the trees typically being saltcedar), all patches of cottonwood-willow types I–III are assumed to provide habitat for the yellow-billed cuckoo.

3.5.1.2 Southwestern Willow Flycatcher

The LCR MSCP HCP defines the extent of existing southwestern willow flycatcher habitat based on field survey delineation of its habitat in the LCR MSCP planning area and not on a habitat model. Prior to an observation of a juvenile southwestern willow flycatcher at the Havasu NWR in 1995, the southwestern willow flycatcher was believed to have been extirpated as a breeding species from the LCR MSCP planning area. As a result of that observation, in 1996 Reclamation initiated and continues to conduct extensive annual surveys for the southwestern willow flycatcher in the LCR MSCP planning area (Gould pers. comm.). The surveys were designed to collect information necessary to:

- determine whether populations are present along the LCR and its tributaries,
- determine breeding status,
- determine the suitability of habitats in the survey area,
- identify the relationships among habitat features and fitness components for the species, and
- determine the status and distribution of the species along the LCR (McKernan and Braden 2002).

Results of information collected on surveys has substantially increased the understanding of the:

- status and distribution of the southwestern willow flycatcher in the LCR MSCP planning area;
- the physical and biological components that compose nesting habitat;
- timing of egg laying, nestling development, fledging, and other life history information;
- factors influencing production of young, including causes and effects of nest parasitism by brown-headed cowbirds and predation;
- survival of adult and juvenile birds; and
- adult and juvenile dispersal patterns.

Table 3-9. LCR MSCP Habitat Models for Selected Species

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
Selected Threatened and Endangered Species									
Yuma clapper rail	X		X	X	X	X	X	Associated primarily with freshwater marshes with water no more than 12 inches deep, unless mats of floating vegetation are present; the highest densities occur in mature stands of dense to moderately dense cattails and bulrushes.	Marsh types 1–7 provide habitat.
Desert tortoise (Mojave population)	X	X	X	X	X	X		Occupies arid lands, typically in association with creosote bush scrub.	Desert scrub provides habitat.
Bonytail		X	X	X[d]	X[d]			In the LCR MSCP planning area, limited to the river reach from Davis Dam to Lake Havasu and artificial impoundments such as ponds and reservoirs.	Reservoir, river, and backwaters provide habitat.
Razorback sucker	X	X	X	X	X			In the LCR MSCP planning area, found in the LCR channel, connected backwaters, and artificial impoundments, such as ponds and reservoirs.	Reservoir, river, and backwaters provide habitat.
Selected Other Covered Species									
Western red bat	X	X	X	X	X	X	X	Occupies riparian and wooded areas, including riparian woodland vegetation consisting of sycamores and cottonwoods; typically roosts in foliage of trees, shrubs, and herbs.	Cottonwood-willow types I and II and honey mesquite type III provide roosting habitat. All land cover types, except developed, are assumed to produce insect prey species and thus provide foraging habitat.
Western yellow bat	X	X	X	X	X	X	X	Known primarily from areas with palm trees, and is known to roost in palm trees; also found in riparian deciduous forests and woodlands and in urban areas with palms in landscaping.	Cottonwood-willow types I and II and honey mesquite type III provide roosting habitat. All land cover types, except developed, are assumed to produce insect prey species and thus provide foraging habitat.
Colorado River cotton rat			X	X				Occupies narrow band of mesic vegetation along the banks of the Colorado River; most often trapped successfully in areas dominated by common reed; has been found in association with irrigated croplands in some areas.	Marsh types 1–7 provide habitat[e].

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
Yuma hispid cotton rat						X	X	Occupies moist, grassy habitats where the rats cut runways through the grass.	Cottonwood-willow provides habitat; all structural types of cottonwood-willow are assumed to support herbaceous understory used by this species; herbaceous understory vegetation is assumed to be either too sparse or soil conditions too dry to support species habitat in other riparian land cover types.
Western least bittern	X		X	X	X	X	X	Usually found in densely vegetated freshwater marshes; in the LCR MSCP planning area, the largest breeding populations are found in extensive cattail and bulrush marshes (e.g., Topock Marsh); smaller populations are found throughout the valley at a variety of marshy areas, including ponds and agricultural canals (Rosenberg et al. 1991).	Marsh types 1–7 provide habitat.
California black rail			X	X	X	X		In the LCR MSCP planning area, typically associated with marsh edges with water less than 1 inch deep and dominated by California bulrush and three-square bulrush.	Marsh types 1–7 provide habitat.
Yellow-billed cuckoo	X		X	X	X	X	X	Typically associated with large patches of mature cottonwood-willow forest.	Cottonwood-willow types I–III provides breeding and migration habitat.
Elf owl			X	X	X			Inhabits saguaro deserts, wooded canyons, and riparian forests; in the LCR Valley, inhabits cottonwood-willow stands and tall mesquite groves with remnant cottonwood or willow snags.	Cottonwood-willow types I and II and honey mesquite type III, provide habitat.
Gilded flicker			X	X	X	X	X	Occupies saguaro deserts, mature cottonwood-willow riparian forests, and occasionally mesquite groves with tall snags (during the breeding season).	Cottonwood-willow types I–III provides habitat.
Gila woodpecker			X	X	X	X		Closely associated with saguaros or large trees used for nesting; in California, found primarily in mature riparian forests, although mesquite stands, orchards, and tall cultivated trees may be used for nesting; riparian trees in isolated patches smaller than 49 acres do not support this species.	Cottonwood-willow types I–V in patches of at least 49 acres, provides habitat.

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
Vermilion flycatcher	X	X	X	X	X	X	X	Along the LCR, usually nests in groves of cottonwood-willow bordered by honey mesquite, open water, and pastures.	Cottonwood-willow types I–V and honey mesquite type III provide habitat
Arizona Bell's vireo	X	X	X	X	X	X	X	At low elevations, largely associated with early successional cottonwood-willow stands and honey mesquite bosques.	Cottonwood-willow types III and IV and honey mesquite types III and IV provide habitat.
Sonoran yellow warbler	X	X	X	X	X	X	X	The yellow warbler is a nesting habitat generalist in mesic second-growth woodland, gardens, and scrubland; along the LCR, formerly nested in cottonwood-willow land cover ranging from gallery forests to early successional scrublands; saltcedar extensively used as a nest substrate plant and as nesting habitat along the Colorado River in the Grand Canyon and at upper Lake Mead; in the LCR MSCP planning area, use of saltcedar as nesting habitat is closely correlated with the presence of open water or moist soil conditions (McKernan and Braden 2002).	Cottonwood-willow types I–IV and saltcedar, saltcedar-honey mesquite, saltcedar-screwbean mesquite, and cottonwood-willow type V and VI components of delineated southwestern willow flycatcher nesting habitat, and unoccupied southwestern willow flycatcher habitat.
Summer tanager	X		X	X	X	X	X	The summer tanager is one of the most characteristic species of cottonwood-willow forests; summer tanagers are also attracted to stands of athel saltcedar along the Colorado River.	Cottonwood-willow types I and II provides habitat.
Flannelmouth sucker			X					Flannelmouth sucker is a riverine species that uses backwaters for juvenile rearing and main channel habitats for spawning and adult rearing.	River and backwaters provide habitat.
MacNeill's sootywing skipper	X	X	X	X				Occupies areas that support dense patches of quailbush (its larval host plant) and other plants that can be used as nectar sources by the adults; adults are obligatory nectar feeders and will fly up to 850 feet away from the host plant to find suitable nectar sources; on the Bill Williams River, adults have been reported to use honey mesquite; other plants used by adults include saltcedar, alfalfa, heliotrope, and sweet bush.	All adjoining patches of atriplex and honey mesquite land cover, extending to 850 feet on each side of the interface of the patches, provide habitat.

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
Selected Evaluation Species									
California leaf-nosed bat	X	X	X	X	X	X	X	Occupies low-elevation habitats, such as desert scrub, alkali scrub, desert washes, riparian associations, and palm oases. Roosting habitat includes caves, tunnels, and other physical structures.	All land cover types, except developed, within 5 miles of roost sites (the known foraging flight distance from roosts [Brown pers. comm.]) are assumed to produce insect prey species and thus provide foraging habitat.
Pale Townsend's big-eared bat	X	X	X	X	X	X	X	Most commonly associated with Mohave mixed scrub (e.g., sagebrush, sagebrush-grassland, blackbrush, creosote-bursage) and lowland riparian communities. Roosting habitat includes caves, tunnels, and other physical structures.	All land cover types, except developed, within 10 miles of roost sites (the known foraging flight distance from roosts [Brown pers. comm.]) are assumed to produce insect prey species and thus provide foraging habitat.

Notes:

X = Species is known or expected to be present in the river reach based on known habitat requirements for the species.

[a] From information presented in Appendix I, "Status of LCR MSCP Covered Species."

[b] River reach locations are shown in Figure 1-1 and described in Chapter 1, "Introduction."

[c] Land cover types are described in Section 3.4. Riparian land cover structural types are described in Table 3-4 and marsh types are described in Table 3-5.

[d] The bonytail is currently not present in the mainstem of Reaches 4 and 5. River, reservoir, and backwater land cover types present in these reaches, however, are included as habitat for this species because it could be introduced into these reaches during the term of the LCR MSCP.

[e] The distribution and specific habitat requirements of this species in the LCR MSCP planning area is not well known. Based on this species apparent affiliation with common reed and mesic vegetation, this species is assumed to be most closely associated with the marsh land cover type. The LCR MSCP Conservation Plan (Chapter 5, "Conservation Plan") includes monitoring and research that, in part, will be implemented to better define this species habitat requirements and provide information that will help guide creation of its habitat.

Table 3-10. Extent of Existing Land Cover Types That Provide Habitat for Selected Species Based on LCR MSCP Habitat Models

	Cottonwood-Willow						Saltcedar				Honey Mesquite		Saltcedar–Honey Mesquite	Saltcedar–Screwbean Mesquite												
Covered Species	**I**	**II**	**III**	**IV**	**V**	**VI**	**III**	**IV**	**V**	**VI**	**III**	**IV**	**IV**	**IV**	**V**	**VI**	Atriplex	Arrowweed	Marsh	River[a]	Reservoir[a]	Desert Scrub	Agricultural Lands	Undetermined Riparian	Developed	Total Habitat
Threatened and Endangered Species																										
Yuma clapper rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,892[a]	0	0	0	0	0	0	11,892
Southwestern willow flycatcher[c]	842	7	560	80	36	2	167	3,175	193	92	0	0	83	27	11	1	0	5	461	177	198	19	24	9	28	6,196[d] (6,548)[e]
Desert tortoise (Mojave population)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,660	0	0	0	10,660[d]
Bonytail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,480	48,401	0	0	0	0	63,881
Humpback chub[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ND	0	0	0	0	0	ND
Razorback sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16,140	204,317	0	0	0	0	220,457
Other Covered Species																										
Western red bat (roosting habitat)	1,693	81	0	0	0	0	0	0	0	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,464
Western yellow bat (roosting habitat)	1,693	81	0	0	0	0	0	0	0	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,464
Desert pocket mouse[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Colorado River cotton rat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,449[c]	0	0	0	0	0	0	6,449
Yuma hispid cotton rat	286	8	854	575	188	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000
Western least bittern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,892[b]	0	0	0	0	0	0	11,892
California black rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,626[b]	0	0	0	0	0	0	11,626
Yellow-billed cuckoo	1,692	81	2,974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,747
Elf owl	790	40	0	0	0	0	0	0	0	0	689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,519
Gilded flicker	1,075	49	2,456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,580
Gila woodpecker	ND	ND	ND	ND	ND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	851
Vermilion flycatcher	1,693	81	2,974	1,503	309	0	0	0	0	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,250
Arizona Bell's vireo	0	0	2,974	1,503	0	0	0	0	0	0	690	5.517	0	0	0	0	0	0	0	0	0	0	0	0	0	10,684
Sonoran yellow warbler	1,693	81	2,974	1,503	36[i]	2[i]	167[i]	3,175[i]	193[i]	92[i]	0	0	83[i]	27[i]	11[i]	1[i]	0	0	0	0	0	0	0	0	0	10,038 (10,390)[j]
Summer tanager	1,692	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,773
Flat-tailed horned lizard[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Relict leopard frog[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Flannelmouth sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,764[j]	0	0	0	0	0	5,764
MacNeill's sootywing skipper	0	0	0	0	0	0	0	0	0	0	23	127	0	0	0	0	106	0	0	0	0	0	0	0	0	256
Sticky buckwheat[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Threecorner milkvetch[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Evaluation Species																										
California leaf-nosed bat (roosting habitat)[l]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pale Townsend's big-eared bat (roosting habitat)[l]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colorado River toad[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lowland leopard frog[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

ND = Not determined.

Unless otherwise noted, land cover types that provide habitat are based on the habitat models described for each species in Table 3-9, and the extent of land cover types providing habitat for each species is derived from Table 3-8.

Rows may not total correctly because numbers were totaled, then rounded.

[a] The acreages shown for the river and reservoir land cover types include the backwater land cover type. The backwater land cover type is not included as a separate land cover type in the LCR MSCP GIS database.

[b] Marsh types 1–7 are assumed to provide habitat for this species. The extent of marsh land cover within the LCR MSCP planning area, however, overestimates the extent of this species habitat because some marsh types can include large proportions of vegetation types and substrates that do not provide habitat for this species (Table 3-5).

[c] Extent of southwestern willow flycatcher habitat is based on direct delineation of occupied and unoccupied habitat. Land cover types that provide habitat are determined by overlaying the land cover type GIS data and delineated polygons of occupied and unoccupied habitat. Consequently, because each of the datasets are not rectified to each other, some land cover types that do not support habitat, such as reservoir, are designated as land cover types that provide habitat. The total extent of occupied and unoccupied habitat in the LCR MSCP planning, however, is correct.

[d] Extent of occupied habitat.

[e] Extent of total delineated existing habitat (i.e., occupied and unoccupied habitat) shown in parentheses. A total of 352 acres of unoccupied habitat is present in the LCR MSCP planning area. Land cover types that provide unoccupied habitat have not been determined and are not shown in this table.

[f] Derived from Appendix H, Table H-1. Represents the extent of desert scrub land cover type present in Reaches 1–6 in California and Nevada.

[g] In the LCR MSCP planning area, transitory habitat for this species can occur within the full pool elevation of Lake Mead. Up to an estimated 62 miles of transitory Colorado River channel that would provide species habitat could be created and occupied by humpback chub when the Lake Mead reservoir pool is maintained at low elevations and that could be subsequently lost when reservoir elevations rise.

[h] The habitat requirements for this species are very narrowly defined, cannot be reasonably correlated to LCR MSCP land cover types, and are not shown in this table. A description of this species' habitat requirements is presented in Table 3-12.

[i] This land cover type, if delineated as southwestern willow flycatcher habitat, is also assumed to provide habitat for this species (see southwestern willow flycatcher in this table).

[j] Extent of total land cover providing habitat shown in parentheses. Includes 352 acres of unoccupied southwestern willow flycatcher habitat that are present in the LCR MSCP planning area that are also considered to provide habitat for this species. Land cover types that provide unoccupied southwestern willow flycatcher habitat have not been determined and are not shown in this table.

[k] The Colorado River and Virgin River channels that are present within the full-pool elevation of Lake Mead when Lake Mead reservoir elevations are below the high pool elevation may provide habitat for this species. The extent of these transitory river reaches are variable among water years, cannot be determined, and are not shown in this table.

[l] Roosting habitat for these species include caves, tunnels, mines, and other physical features that provide suitable microclimate and structural conditions. Features that could provide roosting habitat are most likely associated with terrain located adjacent to the LCR MSCP planning area.

Table 3-11. Extent of Existing Habitat for Selected Species Habitat by River Reach Based on LCR MSCP Habitat Models

	Extent of Existing Habitat by River Reach (acres)[a, b]							
Covered Species	1	2	3	4	5	6	7	Total
Threatened and Endangered Species								
Yuma clapper rail	137	0	4,358	2,091	3,762	1,415	129	11,892
Southwestern willow flycatcher[c]	981	0	3,489	356	1,315	255	153	6,548
Desert tortoise (Mojave population)[d]	223	24	3,594	4,271	155	2,393	0	10,660
Bonytail	0	27,358	23,745	8,144	4,634	0	0	63,881
Humpback chub[e]	ND	0	0	0	0	0	0	ND
Razorback sucker	156,576	27,358	23,745	8,144	4,634	0	0	220,457
Other Covered Species								
Western red bat (roosting habitat)	649	1	690	761	68	227	68	2,464
Western yellow bat (roosting habitat)	649	1	690	761	68	227	68	2,464
Desert pocket mouse[f]	ND	ND	ND	ND	ND	ND	ND	ND
Colorado River cotton rat	0	0	4,358	2,091	0	0	0	6,449
Yuma hispid cotton rat	0	0	0	0	0	1325	675	2,000
Western least bittern	137	0	4,358	2,091	3,762	1,415	129	11,892
California black rail	0	0	4,358	2,091	3,762	1,415	0	11,626
Yellow-billed cuckoo	1,167	0	1,412	486	533	796	352	4,747
Elf owl	0	0	690	761	68	0	0	1,519
Gilded flicker	0	0	1,412	486	533	796	352	3,580
Gila woodpecker	0	0	ND[g]	ND[g]	ND[g]	ND[g]	ND[g]	851
Vermilion flycatcher	1,719	1	1,515	1,503	600	1,286	626	7,250
Arizona Bell's vireo	1,025	4	1,328	6,215	677	1,003	431	10,684
Sonoran yellow warbler	1,989[h]	1[h]	4,025[h]	1,036[h]	1,353[h]	1,379[h]	606[h]	10,390[h]
Summer tanager	649	0	690	72	68	226	68	1,773
Flat-tailed horned lizard[f]	ND	ND	ND	ND	ND	ND	ND	ND
Relict leopard frog[f]	ND	ND	ND	ND	ND	ND	ND	ND
Flannelmouth sucker	ND[i]	0	5,764	0	0	0	0	5,764[i]

Covered Species	Extent of Existing Habitat by River Reach (acres)[a, b] 1	2	3	4	5	6	7	Total
MacNeill's sootywing skipper				256	0	0	0	256
Sticky buckwheat[f]	ND	ND	ND	ND	ND	ND	ND	ND
Threecorner milkvetch[f]	ND	ND	ND	ND	ND	ND	ND	ND
Evaluation Species								
California leaf-nosed bat[j]	0	0	0	0	0	0	0	0
Pale Townsend's big-eared bat[j]	0	0	0	0	0	0	0	0
Colorado river toad[f]	ND	ND	ND	ND	ND	ND	ND	ND
Lowland leopard frog[f]	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Rows may not total correctly because numbers were totaled, then rounded.

ND = Not determined.

[a] Unless otherwise noted, land cover types that provide habitat and river reaches in which species occur or are expected to occur are based on the habitat models described for each species in Table 3-9. The extent of land cover types providing habitat for each species by river reach is derived from Table 3-8.

[b] River reach locations are shown in Figure 1-1 and described in Chapter 1, "Introduction."

[c] Extent of southwestern willow flycatcher habitat is based on direct delineation of occupied and unoccupied habitat.

[d] Derived from Appendix H, Table H-1. Represents the extent of desert scrub land cover type present in Reaches 1–6 in California and Nevada.

[e] In the LCR MSCP planning area, transitory habitat for this species can occur within the full pool elevation of Lake Mead. Up to an estimated 62 miles of transitory Colorado River channel that would provide species habitat could be created and occupied by humpback chub when the Lake Mead reservoir pool is maintained at low elevations and that could be subsequently lost when reservoir elevations rise.

[f] The habitat requirements for this species are very narrowly defined, cannot be reasonably correlated to LCR MSCP land cover types, and are not shown in this table. A description of this species' habitat requirements is presented in Table 3-12.

[g] The extent of habitat has not been determined for specific river reaches but has been determined for the entire LCRMSCP planning area.

[h] Derived from the extent of cottonwood-willow types I–IV in Table 3-8 and the extent of saltcedar, saltcedar-honey mesquite, and saltcedar-screwbean mesquite delineated as occupied and unoccupied southwestern willow flycatcher habitat.

[i] The Colorado River and Virgin River channels that are present within the full pool elevation of Lake Mead when Lake Mead reservoir elevations are below the high pool elevation may provide habitat for this species. The extent of these transitory river reaches are variable among water years, cannot be determined, and are not shown in this table.

[j] Roosting habitat for these species include caves, tunnels, mines, and other physical features that provide suitable micro-climate and structural conditions. Features that could provide roosting habitat are most likely associated with terrain located adjacent to the LCR MSCP planning area.

In addition, information collected on these surveys has substantially increased the knowledge of what is required to successfully restore southwestern willow flycatcher breeding habitat in the LCR MSCP planning area, as well as contributing to the overall understanding of what is likely required to recover the species.

In the LCR MSCP planning area, 6,548 acres of southwestern willow flycatcher occupied and unoccupied habitat have been delineated (Tables 3-10 and 3-11). Occupied southwestern willow flycatcher habitat is defined as "a contiguous area with consistent physical and biotic characteristics where territorial males or pairs of flycatchers have been documented during previous breeding seasons (generally after June 15) at least once since 1996, assuming the habitat has not been degraded or otherwise altered in the interim; if a portion of the contiguous habitat is or was used, the entire contiguous area is considered occupied" (Bureau of Reclamation 2000a). Nesting habitat is occupied habitat where nesting has been confirmed. No nesting has been confirmed below Parker Dam (Reaches 4-7) since 1996. Unoccupied habitat is defined as patches of vegetation with structural characteristics and surface water or soil moisture conditions similar to occupied habitats but where southwestern willow flycatchers have not been observed (McKernan and Braden 2002).

The distribution of known southwestern willow flycatcher occupied habitat is presented on Figure 3-11.

3.5.1.3 Other Covered Species

The habitat requirements for the desert pocket mouse, flat-tailed horned lizard, Colorado River toad, relict leopard frog, lowland leopard frog, humpback chub, sticky buckwheat, and threecorner milkvetch are very narrowly defined and cannot be reasonably correlated to LCR MSCP land cover types. Consequently, the LCR MSCP HCP assesses the presence or absence of these species based on the known range and habitat requirements of these species (Appendix I, "Status of LCR MSCP Covered Species"). Surveys will be implemented to determine if the desert pocket mouse is present before covered activities are implemented. The LCR MSCP impact assessment (Chapter 4) assumes that covered activities and LCR MSCP conservation measures that could affect habitat within the range of the flat-tailed horned lizard, relict leopard frog, humpback chub, sticky buckwheat, and threecorner milkvetch would affect these species. A summary description of the habitat requirements, known occurrences, and assumed distribution by river reach of these species in the LCR MSCP planning area is presented in Table 3-12.

3.5.2 Designated Critical Habitat

Section 7 of the ESA requires that the USFWS evaluate the impacts of implementing the LCR MSCP HCP on ESA-designated critical habitat. ESA-designated critical habitat for the bonytail, razorback sucker, and desert tortoise (Mojave population) occurs within the LCR MSCP planning area. Bonytail critical habitat was designated for the species in 1994. Critical habitat for this species in the LCR MSCP planning area encompasses the LCR from Hoover Dam to Davis Dam (Reach 2) (including Lake Mohave to its full-pool elevation) and the Colorado River and its 100-year floodplain between the northern boundary of Havasu NWR to Parker Dam (Reach 3) (including Lake Havasu to its full-pool elevation) (Figure 3-10b).

Razorback sucker critical habitat was designated for the species in 1994. Critical habitat for this species in the LCR MSCP planning area encompasses Lake Mead to its full-pool elevation (Reach 1), the LCR from Hoover Dam to Davis Dam (Reach 2) (including Lake Mohave to its full-pool elevation), and the Colorado River and its 100-year floodplain from Parker Dam to Imperial Dam (Reaches 4 and 5) (Figure 3-10a).

Humpback chub critical habitat was designated for the species in 1994 along the Colorado River in the Grand Canyon. Humpback chub critical habitat, however, is not present in the LCR MSCP planning area.

Desert tortoise critical habitat was designated for the species in 1994. Designated critical habitat is present in or near the LCR MSCP planning area in California and Nevada west and north of the Colorado River in Reaches 1–4.

On October 12, 2004, the USFWS proposed critical habitat for the southwestern willow flycatcher (69 FR 60706). Critical habitat has been proposed within Reaches 1 and 3–6 (Figure 3-12). The proposed critical habitat for this species in the LCR MSCP planning area encompasses:

- the extent of the Colorado River from Separation Canyon to Pierce Ferry and the Virgin and Muddy Rivers within the full pool elevation of Lake Mead in Reach 1;
- from about thirteen miles below Davis Dam to Parker Dam, including Lake Havasu and Topock Marsh in Reach 3;
- Parker Dam to the upper end of the CRIT in Reach 4;
- all of Reach 5; and
- the portion of Reach 6 extending downstream to 3.5 miles north of the confluence of the Gila River and LCR.

Critical habitat has not been designated for the Yuma clapper rail.

Table 3-12. Distribution, Habitat Requirements, and Known Occurrences of Species with Narrow Habitat Requirements or Distribution in the LCR MSCP Planning Area

	Assumed Distribution by River Reach[a, b]							
Covered Species	1	2	3	4	5	6	7	Summary Habitat Description and Known Occurrences[a]
Humpback chub	X							Historically occupied the Little Colorado, Green, Yampa, White, and mainstem Colorado Rivers; may be present in up to an estimated 62 miles of transitory of Colorado River channel that could be present within the full pool elevation of Lake Mead when the Lake Mead reservoir is at the minimum planned elevation of 950 msl. The humpback chub is considered to have been extirpated from the LCR MSCP planning area below Hoover Dam.
Desert pocket mouse	X	X	X					Known from along the Muddy and Virgin Rivers in southern Nevada and from the Colorado River Valley (Virgin River Delta south to near Topock Gorge); occurs in association with hop-sage *(Grayia spinos*a) in Mojave mixed scrub, creosote-bursage, and salt desert scrub communities
Flat-tailed horned lizard						X	X	Occurs primarily in areas of sparsely vegetated creosote bush scrub or other open vegetation communities; the substrate typically is fine sand on relatively level desert pavement, although the species also can occur in pebbled areas, mudhills, and dune edges; in Arizona, occurs in the Yuma Desert (west of the Tinaja Altas and Gila Mountains) and south of the Gila River; in California, found in the Coachella Valley and south toward the head of the Gulf of California.
Relict leopard frog	X	X						Inhabits springs, marshes, and shallow ponds where water is available year-round; requires adjacent moist upland or wetland soils with a dense cover of grass or forbs and a canopy of cottonwoods or willows; at present, confirmed populations exist exclusively in geothermally influenced and perennial desert spring communities; three sightings occurred in springs near the Overton Arm of Lake Mead, and three sightings occurred in Black Canyon, below Hoover Dam.
Sticky buckwheat	X	X						Appears to be restricted to fine-grained soil habitats and may have a particular affinity for caliche-capped sand or sands containing weathered calcareous rock; range includes an estimated 60-mile area between the Muddy and Virgin River drainages; found from the Middle Point area of Lake Mead, in the southern portion of the species' range, to Weiser Wash in the northwest and Sand Hollow Wash and Coon Creek in the northeast
Threecorner milkvetch	X	X						Occurs in an estimated 75-mile-long (south to north) range extending from near Calville Bay at the Lake Mead NRA to Sand Hollow Wash in Mohave County, Arizona, and southeastern Lincoln County, Nevada; on an east-west axis, occurs across a 40-mile long area, from St. Thomas Gap to Dry Lake Valley.

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description and Known Occurrences[a]
Colorado River toad				?				Requires permanent or semipermanent water sources for breeding and is usually found near streams or other sources of water during periods of wet weather; generally associated with large, somewhat permanent streams, springs, temporary pools, watering holes, and irrigation ditches; historically found in the LCR MSCP planning area from Fort Yuma to the Blythe-Ehrenberg region; most recent observation in the LCR MSCP planning area occurred in 1984, at the Cibola National Wildlife Refuge (Reach 4); current distribution in the LCR MSCP planning area is unknown
Lowland leopard frog								Believed to be extirpated from the lower Gila and Colorado Rivers of Arizona and adjacent California but is known to occur near the LCR MSCP planning area at the Bill Williams River NWR, approximately 7 miles upstream of the Colorado River, in Reach 3

Notes:

X = Species is known or expected to be present in the river reach based on known habitat requirements for the species.

? = It is not known whether the species is present in the river reach. Species not observed in the LCR MSCP planning area in the past 20 years.

[a] From information presented in Appendix I, "Status of LCR MSCP Covered Species."

[b] River reach locations are shown in Figure 1-1 and described in Chapter 1, "Introduction."